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APPENDIX D

That which is claimed is:

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Cont'd
- 5 1. A method for targeting a biologic structure to augment its function which comprises irradiating the biologic structure with acoustic energy having a frequency near or at the resonant frequency of the biologic structure to induce acoustic resonance therein.
2. The method according to claim 1, further comprising determining an acoustic signature of the biologic structure.
- 10 3. A method for targeting a biologic structure to affect at least one function which comprises irradiating the biologic structure with acoustic energy having a frequency near or at the resonant frequency of the biologic structure to induce acoustic resonance therein, and determining at least one acoustic signature and at least one acousto-EM signature of the biologic.
- 15 4. The method according to claim 1, further comprising irradiating the biologic structure with at least one acousto-EM signature of the biologic structure.
5. The method according to claim 1, wherein said acoustic energy is applied at a sufficient power intensity to augment at least one function of the biologic structure, said at least one function being selected from the group of functions consisting of growth, reproduction, 20 regeneration, embryogenesis, metabolism, fermentation, germination, oxidation or reduction activity, wound healing and tissue cutting.
6. The method according to claim 3, wherein said at least one function is selected from the group of functions consisting of disruption and augmentation.
7. The method according to claim 6, wherein said disruption comprises at least one 25 function selected from the group of functions consisting of (a) structural failure of at least

one component in the biologic structure, (b) inhibition of vital processes required for growth, reproduction, metabolism, virulence, and infectivity; wherein said augmentation comprises at least one function selected from the group of functions consisting of growth, reproduction, regeneration, embryogenesis, metabolism, fermentation, germination, oxidation or reduction activity, wound healing and tissue cutting and (c) lysis, shattering, rupture and inactivation.

8. A method for targeting a specific biologic structure to affect at least one function of the biologic structure comprising:

irradiating the biologic structure with at least one electromagnetic (EM) property and/or field to result in acoustic energy having a frequency including said at least one resonant acoustic frequency of the biologic structure, the acoustic energy being present in an amount sufficient to affect at least one function of the biologic structure.

9. The method according to claim 8, wherein said at least one function is selected from the group of functions consisting of disruption and augmentation.

10. The method according to claim 8, wherein said biologic structure comprises at least one structure selected from the group of structures consisting of virus, bacteria, fungi, tissue masses, worms, arthropods, chitins, plants, animals, microorganisms, multicellular organisms, protozoa, liver, muscle, feet, brain, kidney, spleen, blood, lung, lens of eye, aqueous humor, vitreous humor, animal cell, plant cell, proteins, molecules, cell wall, capsule, spore, pili, plasma membrane, organ, portions of structures, components of structures flagellum, cytoplasmic inclusion body, basal body, parasite, appendages, skin, shell, egg, cement/cement plate and bone.

11. A method for specifically targeting a biologic structure and affecting at least one function of the biologic structure by inducing acoustic resonance therein comprising:

a) applying at least two energies selected from the group consisting of at least one acoustic energy and at least one electromagnetic energy, wherein at least one of said at least two energies result in said biologic structure being in acoustic resonance and at least a second

of said at least two energies provides additional energy to said biologic structure; and

b) applying said at least two energies such that an intensity level is achieved to induce acoustic resonance within the targeted biologic structure and to affect at least one function therein.

5 12. The method according to claim 11, wherein said at least one function comprises at least one function selected from the group of functions consisting of augmenting and disrupting.

13. The method according to claim 11, wherein each of said at least two energies results in acoustic resonance within the targeted biologic.

10 14. The method according to claim 11, wherein said at least two energies comprise at least two energies selected from the group consisting of direct current, alternating current, electric field, magnetic field, electromagnetic radiation and acoustic energy.

15. The method according to claim 14, wherein a frequency of the alternating current is applied to the structure.

15 16. A method for targeting a biologic structure to affect at least one function of the biologic structure comprising applying electromagnetic energy to the biologic structure to induce acoustic resonance therein and affect said at least one function.

20 17. The method according to claim 16, wherein said electromagnetic energy comprises at least one source selected from the group consisting of at least one electromagnetic energy pattern of the biologic structure energy equivalent in frequency to at least one resonant acoustic frequency of the structure, at least one acousto-EM signature and at least one resonant acousto-EM energy.

25 18. The method according to claim 16, wherein said electromagnetic energy is applied at a power output level sufficient to affect at least one function of the biologic structure, said at least one function being selected from the group consisting of augmentation and disruption.

30 19. The method according to claim 16, wherein said electromagnetic energy comprises at least one energy selected from the group consisting of direct current, alternating current, electric field, magnetic field, electromagnetic radiation, and fields which include waves, current, flux, resistance, potential and radiation.

20. The method according to claim 19, wherein said electromagnetic energy comprises at

least one applied acousto-EM signature of the biologic structure.

21. The method according to claim 16, further comprising determining at least one signature of the biologic selected from the group of signatures consisting of at least one acousto-EM signature and at least one acoustic signature.

5 22. The method according to claim 21, wherein said at least one signature of the biologic is compared to at least one previously determined reference signature.

23. A method to induce acoustic stimulation of a biologic structure to detect and/or identify a biologic structure comprising:

- 10 a) applying to the biologic structure at least one acoustic energy comprising at least one non-resonant frequency to stimulate the biologic structure; and
- b) receiving at least one electromagnetic energy pattern from the structure; and
- c) determining at least one non-resonant electromagnetic signature of the stimulated biologic structure.

15 24. A system for inducing acoustic stimulation of a biologic structure to detect and/or identify a biologic structure comprising:

- a) means for applying to the biologic structure at least one acoustic energy comprising at least one non-resonant frequency to stimulate the biologic structure;
- b) means for receiving at least one electromagnetic energy pattern from the structure; and
- 20 c) means for determining at least one non-resonant electromagnetic signature of the stimulated biologic structure.

25. A method for detecting and/or identifying an inorganic or biologic structure comprising:

- a) inducing acoustic resonance in the structure; and
- 25 b) detecting at least one acousto-EM signature of the structure.

26. The method according to claim 25, further comprising comparing at least one currently determined acousto-EM signature with at least one previously determined acousto-EM signature of the structure.

27. The method according to claim 25, wherein said at least one acousto-EM signature is produced by at least one of acoustic energy and electromagnetic properties and/or fields.

30 28. The method according to claim 25, wherein acoustic resonance is induced with the

introduction of at least one energy selected from the group consisting of acoustic energy including at least one resonant acoustic frequency of the structure, electromagnetic energy which is substantially equivalent to at least one resonant acoustic frequency of the structure and electromagnetic energy which is substantially equivalent to at least one acousto-EM signature of the structure.

29. A system for identifying a structure by determining at least one resonant acoustic signature of the structure comprising:

- a) means for inducing acoustic resonance in the structure;
- b) means for detecting at least one acoustic signature of the structure; and
- c) means for comparing said at least one acoustic signature of the structure with at least one reference acoustic signature.

30. The system according to claim 29, further comprising a means for detecting at least one acoustic-EM signature of the structure.

31. The system according to claim 30, wherein said structure comprises at least one member selected from the group consisting of inorganic and biologic structures.

32. The system according to claim 29, wherein said means for inducing acoustic resonance in the structure includes at least one signal generating device and at least one transducer.

33. The system according to claim 32, wherein placement of the transducer comprises at least one location selected from the group consisting of on the bottom of a vessel, on the walls of a vessel, in a vessel, intravascularly in the biologic structure, extracorporeally of the biologic structure, in vivo, in vitro, in a hand held probe, a piezoelectric sheet, in a remote control unit and in a scalpel tip.

34. A system for identifying a structure by determining at least one acousto-EM signature of the structure comprising:

- a) means for inducing acoustic resonance in the structure; and
- b) means for detecting said at least one acousto-EM signature of the structure.

35. A system for inducing acoustic resonance in a biologic structure to augment at least one function of the biologic structure comprising:

- a) means for generating at least one acoustic signal;
- b) means for transmitting said at least one acoustic signal to the biologic structure;

and

c) means for controlling the power level of said at least one acoustic signal to augment at least one function of the biologic structure.

36. A system for inducing acoustic resonance in a biologic structure to affect at least one function of the biologic structure comprising:

- 5 a) means for generating at least one electromagnetic signal; and
 b) means for transmitting said at least one electromagnetic signal to the biologic structure.

37. A system for determining induction of acoustic resonance in a structure comprising:

- 10 a) means for generating electromagnetic energy corresponding to at least one acousto-EM signature;
 b) means for transmitting said electromagnetic energy to the structure;
 c) means for receiving at least one signal from the structure when said electromagnetic energy has interacted with the structure; and
 d) means for determining induction of acoustic resonance in the structure.

15 38. A method for determining induction of acoustic resonance in a structure comprising:

- a) irradiating the structure with electromagnetic energy corresponding to at least one acousto-EM signature;
 b) receiving at least one signal from the structure when said electromagnetic energy has interacted with the structure; and
20 c) determining induction of acoustic resonance in the structure.

39. A method to affect at least one function of a living transducer biologic structure comprising applying at least one electromagnetic energy to the biologic structure, said at least one electromagnetic energy comprising at least one frequency which includes at least one resonant frequency of the biologic structure to induce acoustic resonance within
25 the biologic structure, the energy being present in an amount sufficient to affect at least one function of the biologic structure.

40. A method for targeting an inorganic structure to affect said structure, the method comprising applying at least one resonant acousto-EM energy.

41. The method of claim 40, which said structure is affected by disruption.

30 42. The method of claim 40, wherein said structure is affected by augmentation.

43. A method for detecting an inorganic structure comprising:

- a) inducing acoustic resonance in the structure;
- b) detecting at least one resonant acousto-EM energy.

44. A method for detecting an inorganic structure comprising:

- a) inducing acoustic resonance in the structure by applying an acousto-EM signature; and
- b) detecting at least one acoustic signature.

ABSTRACT

The present invention makes use of resonant acoustic and/or acousto-EM energy applied to inorganic or biologic structures for the detection and/or identification, and for
5 augmentation and/or disruption of function within the biologic structure. In particular, the invention provides a method of generating resonant acoustic and/or acousto-EM energy in biologic structures such as virus, bacteria, fungi, worms and tumors for the detection and disruption of these structures. Moreover, the invention provides a method of augmenting functions of biologic structures such as bone through the generation of resonant acoustic
10 and/or acousto-EM energy in the structure. Systems are also provided for the generation and detection of resonant acoustic and/or resonant acousto-EM energy.